# APPLICATIONS OF GPS

**Applications**

The Global Positioning System, while originally a military project, is considered a dual-use technology, meaning it has significant applications for both the military and the civilian industry.

**Military**

The military applications of GPS span many purposes:

- Navigation: GPS allows soldiers to find objectives in the dark or in unfamiliar territory, and to coordinate the movement of troops and supplies. The GPS-receivers that commanders and soldiers use are respectively called the Commanders Digital Assistant and the Soldier Digital Assistant.
- Target tracking: Various military weapons systems use GPS to track potential ground and air targets before they are flagged as hostile. These weapon systems pass GPS co-ordinates of targets to precision-guided munitions to allow them to engage the targets accurately.

Military aircraft, particularly those used in air-to-ground roles use GPS to find targets (for example, gun camera video from AH-1 Cobras in Iraq show GPS co-ordinates that can be looked up in Google Earth).

- Missile and projectile guidance: GPS allows accurate targeting of various military weapons including ICBMs, cruise missiles and precision-guided munitions. Artillery projectiles with embedded GPS receivers able to withstand accelerations of 12,000g's or about 117,600 meters/second2 have been developed for use in 155 mm howitzers.
- Search and Rescue: Downed pilots can be located faster if they have a GPS receiver.
- Reconnaissance and Map Creation: The military use GPS extensively to aid mapping and reconnaissance.
- The GPS satellites also carry a set of nuclear detonation detectors consisting of an optical sensor (Y-sensor), an X-ray sensor, a dosimeter, and an electromagnetic pulse (EMP) sensor (W-sensor) which form a major portion of the United States Nuclear Detonation Detection System.

**Civilian**

Many civilian applications benefit from GPS signals, using one or more of three basic components of the GPS: absolute location, relative movement, and time transfer.

The ability to determine the receiver's absolute location allows GPS receivers to perform as a surveying tool or as an aid to navigation. The capacity to determine relative movement enables a receiver to calculate local velocity and orientation, useful in vessels or observations of the Earth. Being able to synchronize clocks to exacting standards enables time transfer, which is critical in large communication and observation systems. An example is CDMA digital cellular. Each base station has a GPS timing receiver to synchronize its spreading codes with other base stations to facilitate inter-cell hand off and support hybrid GPS/CDMA positioning of mobiles for emergency calls and other applications. Finally, GPS enables researchers to explore the Earth environment including the atmosphere, ionosphere and gravity field. GPS survey equipment has revolutionized tectonics by directly measuring the motion of faults in earthquakes.

The U.S. Government controls the export of some civilian receivers. All GPS receivers capable of functioning above 18 km (60,000 ft) altitude and 515 m/s (1,000 knots) are classified as munitions (weapons) for which U.S. State Department export licenses are required. These parameters are clearly chosen to prevent use of a receiver in a ballistic missile. It would not prevent use in a cruise missile since their altitudes and speeds are similar to those of ordinary aircraft.

This rule applies even to otherwise purely civilian units that only receive the L1 frequency and the C/A code and cannot correct for SA, etc.

Disabling operation above these limits exempts the receiver from classification as a munition. Different vendors have interpreted these limitations differently. The rule specifies operation above 18 km and 515 m/s, but some receivers stop operating at 18 km even when stationary. This has caused problems with some amateur radio balloon launches as they regularly reach 100,000 feet (30 km).

GPS tours are also an example of civilian use. The GPS is used to determine which content to display. For instance, when approaching a monument it would tell you about the monument.

GPS functionality has now started to move into mobile phones en masse. The first handsets with integrated GPS were launched already in the late 1990's, and were available for broader consumer availability on networks such as those run by Nextel, Sprint and Verizon in 2002 in response to U.S. FCC mandates for handset positioning in emergency calls. Capabilities for access by third party software developers to these features were slower in coming, with Nextel opening up those APIs upon launch to any developer, Sprint following in 2006, and Verizon soon thereafter.

GPS Pet Tracking devices use the same network of satellites to pinpoint and transmit information about the whereabouts of a missing pet. These devices are normally attached to the collar of the pet and are to be worn at all times. A GPS pet tracking system will then offer 24/7 tracking of a pet's location via mobile or Internet updates. GPS Pet Tracking Systems may use either radio waves or cell phones to transmit information and receive signals.

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